THE IMPACT AND CHALLENGES OF DIGITAL MOBILE MAPS IN Africa

IGWE J.S.
Computer Science Department
Ebonyi State University,
Abakaliki, Ebonyi State Nigeria
igwejoesun@yahoo.com

Ezeaku Chizoba
Computer Science Department
Caritas University Enugu, Nigeria

Abstract

Developing countries in Africa are benefiting immensely from the digital globalization ushered in by the evolution of mobile phones. There is hardly any sphere of life where digitization via mobile devices is not making gainful waves. One area that is beginning to enjoy high patronage especially in Africa is digital mobile mapping. This paper discusses the impact of digital mobile maps with emphasis on selected countries in Africa such as South Africa, Nigeria, and Uganda. It also exposed the bottlenecks militating against its widespread and acceptance. Suggestions were also on possible solutions to problems that will enable Nigeria and Africa at large to leverage the enormous potential and advantages presented by the advancement in digital mobile map technology.

Author Keywords

Digital Map; Mobile Phone; Impact; GPS, Challenges; opportunities, Technology; Smartphone, Africa, Nigeria

Introduction

Mobile phone is the most commonly used communication gadget in Nigeria and other African Nations [1]. For example, 89% of Nigerian adults own a mobile phone. This impressive penetration and adoption rate of mobile phones tremendously increases with the daily proliferation of mobile Applications (mobile apps.). The Smartphone whether in the form of Androids, iPhones, or iPads provides users with varieties of options to install variety of useful app as may be desired by the user. These developments and the opportunities offered by mobile technologies have made life easier in so many ways.

Just as it is said that the "Internet made the world a **global village"**, mobile phone has turned it into **global room**. Buying and selling of goods and services can be done at any place and anytime courtesy of mobile devices and their APPs. Time, distance, language, money, race, and so on are no longer barriers to accessing information, goods or services all over the globe.

The mobile digital mapping is one revolutionizing application that has been made possible by the mobile technology. Digital mapping (cartography) is the technique of gathering data about a given geographical area with the intention of using it to create maps in image format [2]. Digital mapping refers to the act of mapping with the use of information technology and digital electronics tools. This map illustrates in detail the exact representations of the particular region, showing major road arteries and other popular structures of interest. The tool is also used to calculate distances and time from one location to another. The usage of digital mapping is found in Google Earth and Global Positing System (GPS) of Satellite Network especially in automotive navigation. Digital mapping have helped geologists to achieve the followings: increased accuracy in positioning, enhanced speed of mapping, standardize mapping process, integrate various digital based maps, sharpening of 3-D visualization & interpretation, and in adoption of one-step paperless mapping production [2].

A digital mobile mapping is the technology of using mobile devices in creation and utilization of location maps [3]. With the help of digital mobile mapping, which is hand held device, one can easily trace any area without any human assistance as per direction.

There is no gainsaying the fact that digital mobile mapping is improving the lives of Africans. Amidst these many positive impacts, there are several challenges militating against the expected rapid growth in Nigeria and Africa at large. In this paper, we briefly discuss the benefits and challenges hampering the widespread use of digital mobile map in Africa. We also look at possible remedies.

The good news is that more households in Africa have access to a mobile phone than having access to electricity or even clean water [3].However, access to mobile phone is not enough to enable one fully utilize

the power of digital mobile map, internet connectivity is equally very essential. According to a recent report by Ericsson [4] mobile phones remains the most popular device to access the internet in Nigeria. According to the same report, most mobile phones used in Nigeria (84%) are smart phones and they are connected to the internet. With this high percentage of people having access to both mobile phone and internet service, the chance of imbibing the culture of using digital mobile map could be increased.

Evolution of Mobile Technologies

Mobile technology has evolved through different stages called generations. From the unknown 0G it took off with 1G; this was followed by 2G, 3G, 4G and finally 5G. The G stand for generation as stated earlier. Each of these generations is associated with certain features and capabilities. For instance, 0G is known as Brief case size mobile radio telephones; 1G is called Analog cellular telephony (CDMA); 2G is popular as Digital cellular telephony (GSM); 3G goes for High speed digital cellular telephony (UMTS); 4G is called Architecture, AdHoc, IP core, OFDM and finally 5G is well-known as Packet switched wireless system [5].

0G refers to a period where the world has not witness any form of wireless network.

1G is the first generation of wireless telephone technology, mobile telecommunications that was announced for first time in 1980s but its completion came in early 1990s.Its speed was about 2.4 kilobytes per second. It permits only voice calls within one country. 1G network make use of Analog Signal. Other characteristics include poor voice quality, poor battery life, large phone size; it has no security, limited capacity and poor handoff reliability.

2G technology means 2nd generation. This was based on Global System Module (GSM). 2G was first launched in Finland in 1991. It utilizes digital signals and the data speed was about 64kilobytes per second. Its features Includes: services such as text messages, picture messages and MMS (multimedia message), provision of better quality and capacity. 2G systems were unable to handle complex data such as Videos.

3G technology provides faster communication and permits sending/receiving large email messages. It is high speed web, which ensures for more security. It presents opportunity for video conferencing 3D gaming, TV streaming, mobile TV services, large capacities and broadband capabilities. It requires high bandwidth.

4G Generation started from late 2000s.it capable of providing 100Megabytes per second – 1Gbps speed. It encompasses mobile multimedia, anytime anywhere, global mobility support, integrated wireless solution, customized personal services also known as mobile broadband everywhere.4G is next generations of wireless technology that promises higher data rates and expanded multimedia services. High quality of service and security is the trademark at anytime and anywhere. The major challenges of 4G are increase battery usage, hard to implement and required complex hardware.

5G is a new breed mobile technology that started late 2010. It offers complete wireless communication with almost no limitations. It supports WWWW(Wireless World Wide Web). Its features are high speed, large broadcasting of data in Gigabytes per second, multimedia newspapers, watch TV programs with the clarity, a large phone memory, clarity in audio/video, voice and video streaming. 5G technology offers tough competition to Computers [5]

Trends in Digital Mapping

The origin of digital mapping can be traced to traditional paper maps. Paper maps offer basic landscape analogous to digitized road maps, though more burdensome. It covers only a selected area, and lack many specific details such as road blocks. It also lacked update facility. Digital maps can be updated by synchronization using company servers.

Digital maps earlier before now perform the same fundamental functions just as paper maps. They illustrated representation of roads highlighting the general outlines of the terrain encompassing the area. But today, digital maps have developed with the growth of GPS technology, which supports live traffic updates. Presently, digital map includes points of interest and service locations that make it to be more users' conscious [6]. A user can opt between virtual maps, satellite views or a combination of both. Because digital map supports expansion and updating, newly constructed roads, markets, schools and towns can easily be added as part of the original maps.

Data Collection Methods in Digital Mapping

The bedrock of information used in Digital mappings is the composition of vast quantity of data gathered over time. The data include composition of satellite images and street based data collection. Maps need to be frequently updated to offer users the accurate reflection of a location. There is a wide range of companies that specialize in digital mapping. The essential thing is that digital maps must precisely represent places as they actually appear to give convincing understanding.

Impacts of Digital Mapping in Africa

In reality, in Africa where most countries falls within developing or under developed nations, digital mapping has begun to penetrate certain areas of our daily endeavors. Some of the notable area where digital map is presently impacting in Africa local setting includes:

Easy Navigation: MapIT and Local Based Systems jointly developed MobiMap in 2003 [7]. MobiMap is an innovative application that provides a mobile map service. It was launched to give GSM users an easy and affordable access to street and road maps of South African towns and cities. It offers users an avenue to request and receive digital maps on their phones. It was made to be available on all models of handsets.

Agriculture: Soil scientists have developed digital soil map covering the southern Sahara in Africa. This map covers 42 countries. The essence of the map is to provide latest information about the health status and other properties of the soil. It is helping farmers and other stakeholders to recover nutrient in degraded soils and raise crop production. The map was made from satellite information on the composition of soil nutrients, humidity ratio and organic matter. This digital map is used by scientists to forecast soil properties at locations not yet sampled. Also it helps in verifying the soil models by means of comparing the predicted soil properties alongside actual measurements. A farmer somewhere in Nigeria could use this digital map to ascertain the type of fertilizer, and how much is going to cost him to purchase the quantity commensurate with his or her land size. Information is directly being sent to farmers' mobile phones, which is very common in Africa [8].

Information Capturing and Sharing: Red Hen Systems developed digital map known as MediaMapper Mobile. The major purpose is to photograph, geotag, to save, and share information through Google Earth on Ugandan bats. MediaMapper Mobile is a project funded by several agencies to monitor and measure bat particularly in Uganda, where bats are suspected to be a vector of some diseases. The project deploys catch and releases approach that records detailed measurement and statistics. MediaMapper Mobile App runs on Android phones. It groups the locations of the bats and makes notes on where they were captured. It also geotag pictures/video and store it. Typed and voice notes are usually used for mapping and viewing [9].

Automotive industry: Luxury cars are equipped with digital maps to guide a traveler. This does not save the driver from stress, but increases his confidence level and save one from untold risk associated with driving in a strange area.

From these examples, it becomes obvious that digital Mobile Mapping is a veritable tool and its capabilities are gradually been tapped in Africa.

Problems Militating Against Digital Mobile Mapping in Nigeria and Africa

There are many obstacles that drawback the growth of digital mapping in Nigeria and Africa as large. They include: underdevelopment, illiteracy, political instability, incomplete/incorrect data, and poverty.

Underdevelopment: Because large part of the continent is still far away from modernization, digital mapping enjoys low patronage in those areas. For instance, many rural areas do not have accessible road networks yet and regrettably managing poor quality mobile networks as low as 2 or 1 G technology. People in such areas will not benefit from the digital mobile mapping in their areas.

Illiteracy: literacy level of an individual user is an important element to consider when discussing digital mapping. Someone who cannot read or write though may be in possession of Smartphone but may not be able to explore and enjoy the many benefits it offers.

Political instability: This is a major problem in Africa because so many countries are affected by civil unrest. Digital mapping in a place of civil unrest has no value.A country is not free for digitization in terms of data collection if she is passing through turbulent period. The field workers will have problem accessing those areas. This may lead to vague or fuzzy data that will not properly denotes an area in question.

Incomplete/Incorrect Data: Most often using digital map in our mobile devices, we often notice some "very important" town in a particular state in a country like Nigeria are not represented or misrepresented. Some others are spelt wrongly. This is a problem to tourists that may wish to depend in digital mapping for a journey. This highlights the importance of accurate gathering of information for digitization purpose by the field analyst.

Poverty: Affordability of smartphone is one of the problems of digital mobile mapping in Nigeria and Africa in general. Someone who cannot afford three square meal per day is not in a good position to enjoy mobile devices due to its cost.

Unsteady Power Supply: Unsteady electricity can be a very big problem since most mobile phone has limited battery life after which it needs to be recharged. In many countries in Africa, epileptic power supply is a major issue and some household can live for days, weeks, and months without power. Worst of it all, may villages in African countries lack electricity.

The Way Forward

To address the challenges mention above, all hands must be on deck as some of them require individualistic effort while some requires both government and private sector participation.

Government should embark on developmental projects in rural areas to make them more accessible for data collection. They should build more roads and bridges, install electricity and provide access to potable water. They should also ensure transparency in their dealings with the populace to avoid unnecessary social issues that leads to incessant political instabilities in Africa.

Non-governmental organization should participate in earlier information gathering for mapping purpose. This is because some issues that contribute to incomplete or omission of particular area may be linked to political interest from the elites.

Human resource development should be encouraged by all to eliminate or reduce to bearable minimum the level of poverty and illiteracy in Nigeria and Africa in nearest future.

Technological advancement can also contribute in solving some of the mentioned problems. For example, mobile phone companies could target producing phones with long battery life, phones that do not discharge all and hence do not need to be recharged, and an alternate charging medium that is not based on electricity. This will offer a major advantage for Africans and people from other developing country where power supply is still a major issue. It will help in bridging the mobile digital map adoption gap and present a level ground to tap into the power of mobile digital map.

Conclusion

Mobile digital map is one of the technological revolutions that has the power of easing life, bridging digital gap, and offering solution to many issues faced by mankind especially in developing countries such as Africa. Its application area and potential are limitless. However, many problem hinders its adoption and penetration in Africa. This paper discusses the benefits of digital mobile maps, its application areas, the challenges hindering its adoption in Africa and possible solutions. We believe that if some of the problems discussed in this paper are given attention to and solutions suggested are adopted coupled with creating both awareness and encouraging the use of digital mobile map application in Nigeria and Africa at large, there is no gainsaying that the continent will join the developed economy to derive maximum benefits accrued from digital mapping.Smartphones are the most personal mobile device in Africa and we should make the most advantageous use of them.

References

[1] Jignesh, G. *8 Useful Mobile Applications to Simplify Your Daily Life*. Retrieved July 23, 2016, from https://www.digifloor.com/8usefulmobileapplicationstosimplifyyourdailylife19, 2014.

[2] My Essay Point. *Importance Of Mobile Phone Technology*. Retrieved July 23, 2016, from My Essay Point .com: www.myessaypoint.com, 2015.

[3] MG Africa. *20 striking facts about digital, mobile and tech in Africa; including the*. Retrieved July 23, 2016, from M&G African Writer: http://mgafrica.com/article/2016012220factsaboutdigitalinafrica, 2016.

[4] Aginam, E. *84% of smart phones in Nigeria have internet*. Retrieved July 23, 2016, from Vangaurd News: http://www.vanguardngr.com/2015/04/84ofsmartphonesinnigeriahaveinternetconnectionericssonstudy/, 2016.

[5] Yatharth, Y. *CELLULAR NETWORK GENERATIONS*. Retrieved July 22, 2016, from Prezi: https://prezi.com/9d7vzmyfdlg7/theevolutioninmobiletechnology/, 2014.

[6] Husby, J. In -car Navigation Matures Beyond point A to point B. *Electronic Engineering Times*, 2008 .

[7] COMPUTER BUSINESS REVIEW. *Breakthrough in mobile digital mapping*. www.technews.co.za: TECHNEWS, 2003.

[8] Natasha, G. *Digital soil map for Africa launched*. Retrieved July 23, 2016, from Nature News: http://www.nature.com/news/2009/090113/full/news.2009.17.html, 2009.

[9] Todd, D.. *Mobile Mapping App Capturing Bat Data in Africa*. Retrieved July 23, 2016, from Earth Imaging Journal: Remote Sensing, Satellite Images, Satellite Imagery: http://eijournal.com/news/industryinsightstrends/mobilemappingappcapturingbatdatainafrica, 2016